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BRITANNIA WATER TREATMENT PLANT

OTTAWA

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT - 1986

MAY, 1987

Ontario
Ministry of the Environment

J. Bishop, Director
Water Resources Branch

BRITANNIA WATER TREATMENT PLANT

OTTAWA

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PROGRAM

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ONTARIO MINISTRY OF THE ENVIRONMENT

Southeastern Region

BRITANNIA WATER TREATMENT PLANT
OTTAWA

Location:	Cassels Road Ottawa, Ontario (613-828-2727)
Source:	Ottawa River
Design Capacity:	247.0 1000 M3/day
Operation:	Municipal
Plant Superintendent:	L. Scharfe
Ministry Region:	Southeastern Region Ottawa District Office 2378 Holly Lane Ottawa, Ontario K1V 7P1 (613-521-3450)
Municipalities Served:	Ottawa (304,000) Gloucester (76,589) Vanier (18,877) Nepean (85,737) Kanata (20,529) Goulbourn (9,720)
Treatment Type:	Physical and chemical treatment consisting of coagulation, flocculation, sedimentation and filtration, (conventional) and disinfection as well as post pH adjustment and fluoridation.
Chemicals Used:	Prechlorination - chlorine Coagulation - alum liquid with activated silica (sodium silicate activated with alum) Post chlorination - chlorine Post pH adjustment - calcium carbonate Fluoridation - hydrofluosilicic acid

BRITANNIA WATER TREATMENT PLANT
OTTAWA

EXECUTIVE SUMMARY
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The Britannia Water Treatment Plant, Ottawa was sampled 4 times in 1986; results are given for raw and treated samples.

The parameters analyzed fall into several categories: physical parameters and general chemistry. bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides.

The discussion of results focuses on health-related parameters found in treated water:

(a) **Organic Substances**

Analysis was carried out for approximately 110 organic compounds. The only volatile compounds found, trihalomethanes (THMs) were always present in treated waters; the highest level recorded for total THMs was 206 ug/L.

None of the pesticides analyzed for was found.

No chlorophenolic or chloroaromatic compounds were found.

(b) **Other Parameters**

The aesthetic ODWO* for organic nitrogen was exceeded in one treated water sample as was the ODWO for turbidity. Of the other physical, general chemistry and microbiological parameters and metals analyzed, for which there are health-related ODWO, none exceeded the objectives, in treated water.

The results of these analyses are consistent with those obtained in other areas of the Great Lakes.

The treated water from the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

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* The Ontario Drinking Water Objectives, revised 1983.

BRITANNIA WATER TREATMENT PLANT
OTTAWA

SUMMARY TABLE OF RESULTS
DRINKING WATER SURVEILLANCE PROGRAM, 1986

Britannia Water Treatment Plant was sampled 4 times in 1986.

PARAMETER CATEGORY	TYPE OF SAMPLE RAW	TREATED*
1. GENERAL CHEMISTRY - includes anions such as sulphate, field analyses such as chlorine residual and physical parameters such as colour.		
Total number of parameters in category: 21		
- Total number of analyses completed	72	72
- Total number of positive results	64	57
- **Number of times guidelines exceeded**	N/A	2
Guidelines exceeded - aesthetic ODWO** for organic nitrogen (1)		
- ODWO for turbidity (1)		
2. METALS - includes metals such as copper and lead.		
Total number of parameters in category: 24		
- Total number of analyses completed	88	88
- Total number of positive results	35	35
- **Number of times guidelines exceeded**	N/A	0
3. BACTERIOLOGY - includes bacteria such as coliforms.		
Total number of parameters in category: 5		
- Total number of analyses completed	16	16
- Total number of positive results	15	2
- **Number of times guidelines exceeded**	N/A	0
4. VOLATILES - includes compounds such as benzene and toluene; also included in this category are trihalomethanes (5 parameters), acknowledged to be produced during water treatment.		
Total number of parameters in category: 29		
- Total number of analyses completed	114	114
- Total number of positive results	0	12
- **Number of times guidelines exceeded**	N/A	0
5. PESTICIDES -		
Total number of parameters possible in category: 65		
- Total number of analyses completed	169	169
- Total number of positive results	0	0
- **Number of times guidelines exceeded**	N/A	0
6. CHLOROAROMATICS AND CHLOROPHENOLS - includes a range of chlorinated organic compounds.		
Total number of parameters possible in category: 19		
- Total number of analyses completed	58	58
- Total number of positive results	0	0
- **Number of times guidelines exceeded**	N/A	0

* Total number of analyses completed will not always equal the number of parameters analyzed for multiplied by number of times the supply was sampled, because of accidents during shipping or analyses or analytical difficulties.

** Ontario Drinking Water Objective.

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario is a computerized drinking water information system. The objectives of this program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- an indication of treatment efficiency of plant processes.

Program

The DWSP began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. Water supply locations have been prioritized for surveillance, based primarily on such criteria as population density, probability of contamination and geographical location.

Once the data base becomes established, an assessment of monitoring requirements for the future will be made; monitoring will be continued at the initial locations at an appropriate level and further locations will be phased on to the program as resources permit. It is

estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operation characteristics in the plant at the time of sampling.

Assessments are carried out at all locations prior to sampling in order to acquire full plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations.

Samples are taken of the raw (ambient water quality) and treated water at the treatment plants, and also in the distribution systems. In order to determine possible effects of distribution on water quality, both standing and flowing water in old and new sections of the distribution system are sampled. Sampling is carried out by Ministry of the Environment (MOE) Regional staff and/or Municipal personnel who have been trained in the applicable procedures. Comprehensive sampling kits and documented sampling procedures are made available to samplers. This ensures that samples are taken and shipped according to standard protocols and that field testing will supply reliable data. All analyses are carried out using approved documented procedures.

Data Reporting Mechanism

Final analytical results are usually received by the DWSP reporting system within 6 weeks of the time of sampling. At this time, printouts of the completed analyses are sent to the MOE District Officer and the appropriate MOE regional office, and are also retained by the DWSP co-ordinator. The DWSP is able to monitor analysis results and assess trends. Should the level of

a contaminant exceed a health-related Ontario Drinking Water Objective, action is required as outlined in the publication, Ontario Drinking Water Objectives.* The DWSP issues an "Action Alert" which notifies appropriate MOE and health authorities, and supplies a history of the occurrence of the contaminant in the water supply system concerned.

Parameters Analyzed

About one hundred and forty (140) different parameters are routinely measured on DWSP covering microbiological, organic and inorganic substances of concern, as well as process parameters.

Parameters included in the program are based on the following criteria:

- probability that the substance has the potential to cause problems (health-related or aesthetic);
- probability of occurrence in ambient water;
- availability of routine analytical and sampling methods for monitoring and control purposes;
- feasibility of control.

The range of parameters includes those having Ontario Drinking Water Objectives (ODWO), World Health Organization Drinking Water Guideline values, or other

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* Ontario Drinking Water Objectives, revised 1983, published by the Ontario Ministry of the Environment.

jurisdiction's drinking water objectives (e.g. State of California) as well as compounds of concern to other agencies such as the International Joint Commission, and U.S. Environmental Protection Agency.

The parameters monitored routinely during 1986 are shown in Table 1; this table also includes available guidelines which are appropriate for drinking water, and the analytical detection limit (the lowest concentration that can be detected by laboratory analysis) for each parameter.

Analyses for additional pesticides may be included on certain sampling dates; such additional pesticides are selected from the list shown in Table 1A. These analyses may be done on a seasonal basis, in response to an identified concern or because of a potential for occurrence in certain locations. Seasonal analyses for specified additional pesticides are normally carried out at times corresponding to maximal agricultural use or run-off periods, i.e. in spring and fall seasons.

Drinking Water Guidelines

The Ministry of the Environment published a revised edition of "Ontario Drinking Water Objectives" in 1983.

The primary purpose of drinking water objectives is the protection of the health of the public consuming the water. Aesthetic considerations may also provide a basis for drinking water objectives, since the water should be pleasant to drink. The control of such aspects of water quality as hardness, corrosiveness, etc. is also important. The limits set are considered to outline the minimum requirements necessary to fulfill the above objectives, and may be either health-related or related to aesthetic and other considerations.

Because this survey covered such a large number of parameters, many of them did not have an ODWO. In order to be able to compare data results to health guidelines, it was necessary to refer to objectives and guidelines developed by other jurisdictions.

The footnotes to Table 1 indicate the sources and derivation of the various guidelines.

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
CHEMISTRY:			Barium	1 mg/L	0.001 mg/L
Conductivity	-	0.01 UMHO/CM	Boron	5 mg/L	0.02 mg/L
			Beryllium	-	0.001 mg/L
Hardness	-	0.5 mg/L	Cyanide	0.2 mg/L	0.001 mg/L
Calcium	-	0.1 mg/L	Cadmium	0.005 mg/L	0.0003 mg/L
Magnesium	-	0.05 mg/L	Cobalt	-	0.001 mg/L
Sodium	-	0.1 mg/L	Chromium	0.05 mg/L	0.001 mg/L
Alkalinity		0.2 mg/L	Copper	1 mg/L	0.001 mg/L
pH	-	-	Mercury	1 µg/L	0.01 µg/L
Fluoride	2.4 mg/L	0.01 mg/L	Molybdenum	-	0.001 mg/L
Chloride	250 mg/L	0.2 mg/L	Nickel	-	0.002 mg/L
Residue total (solids)	-	1 mg/L	Lead	0.05 mg/L	0.003 mg/L
Turbidity	1 FTU	.01 FTU	Selenium	0.01 mg/L	0.001 mg/L
Phosphorus	-	0.002 mg/L	Strontium	-	0.001 mg/L
Phosphates	-	0.0005 mg/L	Vanadium	-	0.001 mg/L
Nitrogen Total Kjeldahl	0.15 mg/L*	0.1 mg/L	Zinc	5 mg/L	0.001 mg/L
Ammonium Total	-	0.05 mg/L			
Colour	5 TCU	0.5 TCU	BACTERIOLOGY (RAW ONLY):		
Nitrates Total	10 mg/L as N	.05 mg/L	Total Coliform MF	-	0
			Total Coliform MF BKGD	-	0
Nitrite	1 mg/L as N	0.0005 mg/L	Fecal Coliform	-	0
			Standard Plate Count MF	-	0
METALS:			(TREATED ONLY):		
Uranium	0.02 mg/L(t)	0.002 mg/L‡	Present/Absent (P/A) Test	Absent	Absent
Iron	0.3 mg/L	0.002 mg/L	Total Coliform MF BKGD	-	0
Manganese	0.05 mg/L	0.001 mg/L	Fecal Coliform	0	0
Aluminum	-	0.003 mg/L	Standard Plate Count MF	<500 orgs/mL	0
Arsenic	0.05 mg/L	0.001 mg/L			

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
VOLATILES:			CHLOROAROMATICS:		
1,1-Dichloroethylene	0.3 µg/L(h)	1.0 µg/l	Hexachloroethane	19000 ng/L(e)	1 ng/L
Dichloromethane	40 µg/L(c)	5 µg/L	1,3,5-Trichlorobenzene	10000 ng/L(y)	5 ng/L
TRS-1,2-Dichloroethylene	-	1 µg/L	1,2,4-Trichlorobenzene	15000 ng/L(y)	5 ng/L
1,1-Dichloroethane	-	1 µg/L	Hexachlorobutadiene	4500 ng/L(e)	1 ng/L
Chloroform	350 µg/L++	1 µg/L	1,2,3-Trichlorobenzene	10000 ng/L(y)	5 ng/L
1,1,1-Trichloroethane	1000 µg/L(c)	1 µg/L	2,4,5-Trichlorotoluene	-	5 ng/L
1,2-Dichloroethane	10 µg/L(h)	1 µg/L	2,3,6-Trichlorotoluene	-	5 ng/L
Carbon Tetrachloride	3 µg/L(h)	1 µg/L	1,2,3,5-Tetrachloro-		
Benzene	10 µg/L(h)	1 µg/L	benzene	-	1 ng/L
1,2-Dichloropropane	-	1 µg/L	1,2,4,5-Tetrachloro-		
Trichloroethylene	30 µg/L(h)	1 µg/L	benzene	38000 ng/L(e)	1 ng/L
Dichlorobromomethane	350 µg/L++	1 µg/L	2,6,A-Trichlorotoluene	-	5 ng/L
Toluene	100 µg/L(c)	1 µg/L	1,2,3,4-Tetrachloro-		
1,1,2-Trichloroethane	6 µg/L(e)	1 µg/L	benzene	-	1 ng/L
Chlorodibromomethane	350 µg/L++	1 µg/L	Pentachlorobenzene	74000 ng/L(e)	1 ng/L
Tetrachloroethylene	10 µg/L(h)	1 µg/L	Total PCB's	3000 ng/L(t)	20 ng/L
Chlorobenzene	100-300 ng/L(h)*	1 ng/L			
Trifluorochlorotoluene	-	1 µg/L	PESTICIDES:		
Ethylbenzene	1400 µg/L(e)	1 µg/L	Hexachlorobenzene	10 ng/L(h)	1 ng/L
Ethylene Dibromide	0.02 µg/L(x)	1 µg/L	Heptachlor	3000 ng/L+++	1 ng/L
P-Xylene	620 µg/L(c)	1 µg/L	Aldrin	700 ng/L**	1 ng/L
M-Xylene	620 µg/L(c)	1 µg/L	PP-DDE	d	1 ng/L
O-Xylene	620 µg/L(c)	1 µg/L	Mirex	-	5 ng/L
Total Trihalomethanes	350 µg/L++	3 µg/L	Alpha BHC	700 ng/L(c)	1 ng/L
Bromoform	350 µg/L++	1 µg/L	Beta BHC	300 ng/L(c)	1 ng/L
1,1,2,2-Tetrachloroethane	1.7 µg/L(e)	1 µg/L	Gamma BHC (Lindane)	4000 ng/L	1 ng/L
1,4-Dichlorobenzene	400 µg/L(e)	1 µg/L	Alpha Chlordane	7000 ng/L***	2 ng/L
1,3-Dichlorobenzene	400 µg/L(e)	1 µg/L	Gamma Chlordane	7000 ng/L***	2 ng/L
1,2-Dichlorobenzene	400 µg/L(e)	1 µg/L	Oxychlordane	-	2 ng/L

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
Pesticides (cont'd)					
OP-DDT	30000 ng/L(d)	5 ng/L			
PP-DDD	d	5 ng/L			
PP-DDT	d	5 ng/L			
Methoxychlor	100000 ng/L	5 ng/L			
Heptachlor Epoxide	3000 ng/L+++	1 ng/L			
Endosulfan 1	74000 ng/L(ea)	2 ng/L			
Dieldrin	700 ng/L**	2 ng/L			
Endrin	200 ng/L	4 ng/L			
Endosulfan 2	74000 ng/L(ea)	4 ng/L			
Endosulfan Sulphate	-	4 ng/L			
Octachlorostyrene	-	1 ng/L			
Toxaphene	5000 ng/L	PA(xx)			

Footnotes:

(l) = Ontario Drinking Water Objectives (ODWO) for drinking water, unless noted.

(t) = ODWO Interim maximum acceptable concentration (IMAC) for drinking water.

(c) = California State Department of Health Action Level for drinking water.

(d) = ODWO for DDT (contains other isomers such as OPDDT and PPDDT).

(e) = US EPA ambient guideline; guideline levels when it is assumed that untreated water and fish and shellfish are consumed from the same body of water.

(ea) = United States Environmental Protection Agency (US EPA) ambient level for endosulfan (contains other isomers).

(h) = World Health Organization (WHO) guideline for drinking water.

(h)* = World Health Organization (WHO) Odour Threshold for drinking water.

(x) = State of Florida, maximum contaminant level for drinking water.

(xx) = the presence of toxaphene is detected in scan used; positive samples would be quantified by special additional analysis.

(y) = New York State (Taste and Odour) proposed drinking water guideline.

++ = total Trihalomethanes.

+++ = combined total; Heptachlor and Heptachlor Epoxide.

* = total Kjeldahl Nitrogen minus Ammonia Nitrogen.

** = total of Aldrin and Dieldrin.

*** = Chlordane is a mixture of alpha and gamma isomers.

‡ = Analysis changed to mass spectrometry method in mid-1986, detection limit 0.0001 mg/L.

TABLE 1A: DRINKING WATER SURVEILLANCE PROGRAM SPECIAL PESTICIDES

Dicamba	Reldan
2,4-D	Ronnel
2,4-DB	Carbofuran
2,4-DP	Propoxur
2,4,5-T	IPC
Silvex (2,4,5-TP)	Aminocarb
Picloram	CIPC
2,4,6-Trichlorophenol	Eptam
2,4,5-Trichlorophenol	Benonyl
2,3,4-Trichlorophenol	Bux
2,3,5,6-Tetrachlorophenol	Diallate
2,3,4,5-Tetrachlorophenol	Sevin
Pentachlorophenol	Sutan
Diazinon	Propazine
Dichlorvos	Atrazine
Dursban	Simazine
Ethion	Sencor (metribuzin)
Guthion	Bladex (Cyanazine)
Malathion	Prometone
Mevinphos	Ametryne
Methyl Parathion	Prometryne
Methyl Trithion	Atratone
Parathion	Alachlor
Phorate (Thimet)	Metolachlor

RESULTS AND DISCUSSION

The parameters analyzed fall into several categories: physical parameters and general chemistry (chemistry), bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides. Many of the substances analyzed for are naturally-occurring or treatment by-products.

The results of analysis of raw and treated water samples are shown in Tables 2 and 3. Table 2 shows the categories of parameters analyzed, as well as the total number of analyses which were completed in each category for both raw and treated water samples and the total number of positive results which were obtained. Table 3 lists the sampling dates and the numerical values for each parameter for which analysis produced a positive (quantifiable) result.

The Britannia Water Treatment Plant (Ottawa) was sampled four times in 1986.

(a) Non Organic Substances

There are 121 positive results of 144 reported analyses for physical parameters, such as pH and temperature and general chemistry tests. The results of these tests are used as an indication of the analytical validity and integrity of the samples, the general characteristics of the water, and as a guide to making an assessment of the treatment process; they may also indicate whether any changes occur during the time elapsing between sampling and actual analysis. On September 23, 1986, field turbidity in the treated water, at 3.1 FTU exceeded the ODWO of 1 FTU; turbidity may interfere with disinfection and the maintenance of

a chlorine residual. Since the corresponding laboratory turbidity result was negative, the field reading was probably due to sampling error. Organic nitrogen exceeded the aesthetic ODWO in one treated water sample; levels of organic nitrogen above the limit can result in taste and odour problems.

Positive results were obtained for 17 analyses for bacterial parameters out of a total number reported of 32. These bacterial tests include those for species of paramount importance from a public health point of view, and those which assess the general bacteriological quality and characteristics of the water; by this means, a measure is obtained of the overall efficiency of water treatment processes. There were only two positive results obtained for treated water samples; these were for standard plate count (a measure of the total number of bacteria in a water sample) with the maximum count being 3 organisms per mL; the ODWO recommend that treated water not exceed 500 organisms per mL for standard plate count.

Analyses of 176 tests for metals in the water samples were reported; of these 70 were positive results. Metals can occur naturally and most are generally regarded as being ubiquitous. However, some may be present in water as a result of industrial or other discharges. A small number of metals have public health significance.

Of those parameters discussed above for which there are ODWO, none exceeded the Objectives, with the exception of organic nitrogen and turbidity. Nor did the levels exceed any guidelines for drinking water set by other jurisdictions, such as the U.S.

Environmental Protection Agency (US EPA), the World Health Organization (WHO) and Health & Welfare, Canada (H&W, Canada). Furthermore, the results of these analyses are consistent with those obtained in other areas of the Great Lakes.

(b) Organic Substances

Of a total of 228 analyses for volatile organic compounds, only 12 were positive; these were from treated water samples and were all due to the presence of trihalomethanes.

Trihalomethanes (THMs) are acknowledged to be produced during the water treatment process and will almost always only occur in treated waters. Trihalomethanes are comprised mainly of chloroform, chlorodibromomethane and dichlorobromomethane with bromoform occurring occasionally. Results are reported for the individual compounds as well as for their sum, which is expressed as total trihalomethanes (total THM). The ODWO for total THM is 350 ug/L; this level was not exceeded in any of the water samples included in this report, the highest level recorded being 206 ug/L on September 23, 1986.

One hundred and ninety six (196) tests were carried out for twenty three different pesticides; none was found above trace levels. Special pesticides, including the chlorophenolic compounds (Table 1A), were analyzed for in both raw and treated water on one occasion (October 28, 1986); none was found. This analysis is carried out only once or twice a year at each supply, on a seasonal basis, to correspond to the use and/or loss of such pesticides on agricultural land. Of the eleven

pesticides that were analyzed for monthly, in addition to the routine pesticides (propazine, atrazine, simazine, Sencor, Bladex, prometone, ametryne and prometryne, atratone, metolachlor and alachlor), none was found.

A total of 104 analyses were carried out for chloroaromatic compounds and there were no positive results.

CONCLUSIONS

The data reveal that for metals, inorganic ions, and bacterial parameters, raw water values are frequently in the detectable range; levels of metals and inorganics are also found in treated water. The levels of metals, inorganic compounds, and bacteria are consistent with those found in other water supplies in the province.

For the organic compounds, most are below detection levels, even though the most sophisticated equipment available was employed in the chemical analysis.

ODWO have not been established for some of the compounds analyzed; for these few compounds, use was made of appropriate guidelines set by other agencies, such as the World Health Organization, the US Environmental Protection Agency, Health and Welfare Canada or other agencies. None of these guidelines was exceeded.

The treated water at the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

TABLE 2

BRITANNIA WATER TREATMENT PLANT
OTTAWA

	PARAMETER GROUP	TYPE OF SAMPLE RAW	TREATED
1.	GENERAL CHEMISTRY		
	- Total samples	72	72
	- Total positives	64	57
2.	METALS		
	- Total samples	88	88
	- Total positives	35	35
3.	BACTERIOLOGY		
	- Total samples	16	16
	- Total positives	15	2
4.	VOLATILES		
	- Total samples	114	114
	- Total positives	0	12
5.	PESTICIDES		
	- Total samples	98	98
	- Total positives	0	0
6.	CHLOROAROMATICS		
	- Total samples	52	52
	- Total positives	0	0
7.	CHLOROPHENOLS		
	- Total samples	6	6
	- Total positives	0	0
8.	SPECIAL PESTICIDES		
	- Total samples	71	71
	- Total positives	0	0

Table 3

BRITANNIA WATER TREATMENT PLANT OWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/09/23	86/10/28	86/11/24	86/12/15								
ALKALINITY	MG/L-CAC	R	34.100	30.500	24.100	27.600								
		T	33.100	30.600	26.600	31.200								
ALUMINUM	MG/L-AL	R	.093	.140	.190	.190								
		T	.043	.160	.120	.083								
ARSENIC	MG/L-AS	R		.001	.001									
		T		.001										
BARIUM	MG/L-BA	R	.017	.018	.091	.017								
		T	.022	.018	.015	.016								
CALCIUM	MG/L-CA	R	12.300	10.500	8.900	9.800								
		T	20.500	20.200	17.700	19.700								
CHLORIDE	MG/L-CL	R	[illegible]		2.350	2.500								
		T	6.500	6.000	5.350	5.500								
COLOUR	HZU	R	31.500	38.000	38.500	36.000								
		T	2.500	3.000	5.000	4.500								
CONDUCTIVITY	UMHO/CM	R	95.400	91.500	81.600	87.600								
		T	153.00	154.00	139.00	149.00								
CHROMIUM	MG/L-CR	R				.001								
		T				.001								
COPPER	MG/L-CU	R	.012	.012	.010	.012								
		T	.001	.001	.001	.001								
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R	114.00	78.000	102.00	11.000								
		T												

Table 3 (cont'd)

BRITANNIA WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/09/23	86/10/28	86/11/24	86/12/15								
IRON	MG/L-FE	R	.130	.180	.210	.200								
		T	.010	.160	.013	.010								
FLUORIDE	MG/L-F	R		.070		.070								
		T		.850	.950	.840								
FIELD COMBINED CHLORINE RESIDUAL	MG/L-CL	R												
		T	.100	.100	.100	.100								
FIELD FREE CHLORINE RESIDUAL	MG/L-CL	R												
		T	1.200	1.600	1.600	1.550								
FIELD TOTAL CHLORINE RESIDUAL	MG/L-CL	R												
		T	1.300	1.700	1.700	1.650								
FIELD PH		R	7.400	7.300		7.300								
		T	8.400	7.500		7.900								
FIELD TEMPERATURE	DEG.C	R	17.000	12.800	5.700	3.600								
		T	16.000	11.800	3.600	2.000								
FIELD TURBIDITY	FTU	R	1.500	1.300	1.500	1.700								
		T	3.100	.270	.180	.470								
HARDNESS	MG/L-CAC	R	40.500	37.000	31.500	34.000								
		T	62.500	61.000	54.000	59.500								
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	R												
		T		3.000		1.000								
MERCURY	UG/L-HG	R				.020								
		T				.020								
MAGNESIUM	MG/L-MG	R	2.400	2.600	2.250	2.300								
		T	2.700	2.550	2.350	2.550								

Table 3 (cont'd)

BRITANNIA WATER TREATMENT PLANT OWSP RESULTS

02/11/87

PARAMETERS	UNITS		SAMPLE DATE 86/09/23	86/10/28	86/11/24	86/12/15							
MANGANESE	MG/L-MN	R	.010	.013	.012	.011							
		T	.005	.009	.008	.007							
SODIUM	MG/L-NA	R	3.100	2.700	2.190	3.000							
		T	3.200	3.100	3.100	3.300							
AMMONIUM TOTAL	MG/L-N	R	.012	.020		.020							
		T	.008	.014									
NITRITE	MG/L-N	R	.006	.005		.018							
		T	.003										
TOTAL NITRATES	MG/L-N	R	.220	.195	.355	.265							
		T	.165	.210	.335	.250							
NITROGEN TOTAL KJELDAHL	MG/L-N	R	.280		.240	.300							
		T	.130			.180							
PH		R	7.830	7.770	7.800	7.810							
		T	8.100	7.860	7.920	7.910							
PHOSPHORUS FIL REACT	MG/L-P	R	.003	.003	.002	.002							
		T		.005									
PHOSPHORUS TOTAL	MG/L-P	R	.013	.012	.018								
		T		.012	.013								
TOTAL SOLIDS	MG/L	R	76.000	72.000	53.000 CRO	64.800							
		T	97.600 CRO	100.00 CRO	90.400 CRO	89.800							
STRONTIUM	MG/L-SR	R	.050	.052	.045	.042							
		T	.071	.065	.054	.049							

Table 3 (cont'd)

BRITANNIA WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/09/23	86/10/28	86/11/24	86/12/15								
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R	156.00 A3C	300.00 A3C	1700.0	63 000 A3C								
		T												
TOTAL COLIFORM BACKGROUND MF	CT/100ML	R	8400.0		2900.0	310.00								
		T												
TURBIDITY	FTU	R		2.000	2.700	1.920								
		T			.780	.200								
URANIUM	UG/L-U	R	.110	.090	.100									
		T	.080	.040	.050									
VANADIUM	MG/L-V	R				.001								
		T			.001	.001								
CHLOROFORM	UG/L	R												
		T	203.00	145.00	145.00	120.00								
DICHLOROBROMOMETHANE	UG/L	R												
		T	3.000	3.000	1.000	2.000								
TOTAL TRIHALOMETHANES	UG/L	R												
		T	206.00	148.00	146.00	122.00								
ZINC	MG/L-ZN	R	.014		.020	003								
		T	.014		.001	.002								